The American FERTILIZER

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The American FERTILIZER

Vol. 111 OCTOBER 1, 1949 No. 7

Nitrogen for Proteins and Protection Against Disease*

By Dr. William A. Albrecht

Chairman, Department of Soils, University of Missouri College of Agriculture

PROVISIONS of our food and feed proteins is a serious problem. Getting meat, milk, eggs, seeds and similar body-building foods has long been a major part of the struggle to feed ourselves. An adequate supply of protein supplements is the problem in feeding our animals. We are not satisfied to nourish ourselves with seed proteins only. We want and need proteins of animal origin too. Not even all the animals can get along on only vegetable proteins as can chickens and hogs. Grains contain protein in their germ, and meat, milk solids and eggs are made up almost wholly of that essential food constituent, yet we have given little or no thought to the supply of nitrogen in the soil required for the plant's fabrication of protein and the solution of the food problem. We have not thought of nitrogen in the soil as necessary for the synthesis of different proteins. Much less have we given proper credit to proteins for the multilateral protection they provide against hunger in the life struggles of microbes, plants, animals and man.

How to accurately measure proteins is still an unsolved problem, even though nitrogen is accepted as synonymous with proteins, the measurement of nitrogen alone has not been a satisfactory gauge of the quantity or quality of a protein. This is suggested by the fact that nitrogen is generally regarded as constituting about 16 per cent of protein, since in determining the protein content of a substance we usually multiply its nitrogen content by 6.25. The cereal chemist multiplies the nitrogen by 5.73 because he says that cereal protein has over 17 per cent nitrogen.

This indicates that nitrogen is converted into organic compounds of carbon, hydrogen and oxygen to make proteins with different ratios of carbon, for example, to nitrogen. The very components of proteins are therefore highly variable. Consequently the process of igniting a substance in sulphuric acid, measuring the nitrogen obtained and multiplying it by a single arithmetical factor like 6.25, is not a very accurate measure of the protein. If it is the nitrogen that is significant in relation to the other constituents of the protein molecule, then surely the total nitrogen, including other than protein forms, handled by a mathematical factor in common usuage by a majority of analytical chemists is not an accurate gauge of protein. Measuring this essential part of our foods is still a problem, with much to be learned for our better nutrition and improved health.

How proteins are put together from the elements is another baffling problem. They consist of combinations of smaller units, or amino acids, which, although they are called acids and will react with alkalies, are also reactors with acids. In that sense they are of dual nature as to chemical reaction. Much has been learned about the chemical structure of protein, but how Nature starts with the separate elements, i.e., carbon, hydrogen, oxy-

* Reprinted from *Victory Farm Forum*, September, 1949, published by Chilean Nitrate Educational Bureau, 120 Broadway, New York City.

gen, and nitrogen, and builds an amino acid is still unknown. How sulphur and phosphorus are put into the protein molecule is another unsolved mystery of the creative processes of growth. While we can separate a protein into its amino acids, and can separate them into their chemical elements, this gives no clue to the processes by which they are put together in Nature. We have to depend upon Nature to guide the chemical synthesis of them.

Animals Assemble Proteins

When we speak of animal proteins and vegetable proteins we do not mean to suggest that the animal has built them from the separate elements. Animals only assemble the proteins. They must find the required amino acids for that purpose in the vegetable or plant proteins they consume. Apparently it is their inability to create proteins that makes higher animals dependent on plants and microbes supposedly below them in the evolutionary scale.

Microbes and plants can take the elements, or simple compounds of them, and build them into amino acids. Although in simplest terms it appears that the plant uses air and water, under solar power, to make carbohydrates and then uses nitrogen from the soil or from the air to make amino acids, the process is far more complex. Were it not so, proteins might not be a problem. Instead they should be as plentiful as carbohydrates. All plants are made up mainly of carbohydrates. Microbes and plants are able to synthesize proteins from the elements, but not without a struggle for it is a problem for them too, even to make the simpler proteins by which they live but which alone would not support us or our animals.

Microbes synthesize only limited kinds of amino acids and limited combinations of them as proteins. Some protein products may be very important to us but microbes require more than their component elements for their fabrication. Apparently more is required for protein elaboration by plants than the combination of nitrogen, sulfur and phosphorus from the soil with carbohydrates. Legumes, that are particularly appreciated as synthesizers of protein, require calcium, phosphorus, potassium, magnesium, boron, manganese, copper and other elements from the soil for their growth processes. When we say that these better forage feed crops are "hard to grow," we mean that it is difficult to get these plants to produce proteins. These essential food constituents for us are not readily manufactured. They require not only nitrogen (so commonly deficient) in the soil, but they also require soils fertile in more respects than is commonly recognized.

It is natural to expect, then, that microbes with simpler requirements for growth will produce only the simpler proteins. Plants, which we think of as easy to grow or which are growing on less fertile soil, will also create the simpler proteins, proteins simpler than those created by plants failing to grow on such soils. Shall we not then expect a larger variety of amino acids and a greater total of them, in plants growing on soil better supplied not only in the major nutrient elements, but also in what are commonly thought of as trace elements?

If animals have more complex food requirements, particularly for the amino acids of proteins which they cannot synthesize, it is not difficult to believe that an extensive list of soil fertility elements will be required to synthesize the various kinds of proteins they need. Man doubtless is in the same category as the animals. If the soil, then, fails to provide adequate supplies of the required fertility elements, shall we not look for deficiencies first in the variety of proteins needed by animals, and second in those proteins needed to grow the plants commonly considered as being more nutritious as animal feeds? If so, is it not reasonable to suggest that the output of proteins in terms of the supply of the different amino acids and of the sum total as protein is a direct reflection of the fertility of the soil?

Nitrogen Builds Proteins

If animals are to obtain all of the amino acids they need, they must gather their feeds from many simple sources and many soils, or from a single soil that is highly complex in its content of fertility elements. Complete proteins, therefore, in terms of animal and human nutrition, require a very fertile soil. Conversely, it is not surprising then if a shortage of nitrogen, phosphorus, calcium, boron, manganese or of any other essential nutrient element in the soil should produce crops in which the total protein content though high, might be inadequate in respect of the required amino acids needed by animals or man for good substance and good health.

The production of proteins, in their fullest amounts and variety through plant growth may constitute a complex demand upon the fertility of the soil. Nevertheless, there seem to be no greater values to be had from soil treatments than the contributions they make to the elaboration of proteins in the crop. Traditionally, nitrogen has been used to grow

(Continued on page 26)

Experiment Stations Advocate More Nitrogen

Recent State Experiment Stations Bulletins and News Releases Emphasize Need for Greater Quantities of Nitrogen Fertilizers

Nitrogen Upholds Reputation as Yield Booster for Corn

Nitrogen is upholding its reputation as a yield-boosting plant food for corn on land that two years ago was mostly poverty grass and broomsedge, report researchers at Virginia Experiment Station.

Yields went from 13 bushels per acre where no nitrogen was applied, to 74 bushels where 150 pounds of nitrogen were applied. The corn land previously had received two tons of lime per acre, and 800 pounds of 0–12–12—the only recorded fertilization on soil that had been abandoned for many years.

The experiment is being revised this year, however, to discover why the corn was of poor quality.

The research, conducted by H. L. Dunton and S. S. Obenshain, is a continuation of a project begun in 1947, when an increase from 16 pounds of nitrogen to 200 pounds of nitrogen per acre resulted in a corresponding increase in corn yields from 32 to 90 bushels per acre. The land, similar to that figuring in the more recent study, had received two tons of lime and 800 pounds of 2–12–12. After the 1947 corn harvest, wheat was planted. No additional fertilizer was applied. Wheat yields on the land where corn had received 16 pounds of nitrogen were only about 12 bushels per acre. Wheat yields following the corn that received 200 pounds of nitrogen were 22 bushels per acre.—*V. P. I. Agricultural News Letter, Blacksburg, Va.*

Bulletin on Corn Fertilization in North Carolina

Bulletin No. 366, *Fertilizer Corn for Higher Yields*, which presents all research findings to date on the most effective methods of fertilizing corn in North Carolina, has recently been published by the North Carolina Agricultural Experiment Station.

The 52-page bulletin was prepared by Dr. B. A. Krantz, research professor of agronomy at State College and soil scientist in the division of soil management and irrigation, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture. It is illustrated with numerous color photographs, charts, and slides.

Krantz relates in detail the results of a research program started in 1943 to determine how to fertilize corn most effectively when good hybrids are used along with good cultural practices. His most important conclusion was that nitrogen is the most limiting factor in corn production in North Carolina. It was found that corn yields increased about one bushel for each two pounds of nitrogen applied within the range of response to nitrogen.

In 1947, one acre not treated with nitrogen produced only 19.1 bushels of corn while an adjoining acre which received 180 pounds of nitrogen produced 120.9 bushels of corn.

"The lowest cost of production per bushel and the greatest profit per acre were obtained where nitrogen was applied at the rate of 120 pounds per acre with adequate phosphorus and potash," Krantz says.

The color photographs, made by Dr. L. S. Bennett, are used to illustrate the symptoms of nitrogen deficiency in corn. Charts prepared by Miss Ruth Gray show the yields obtained with various methods of fertilization.

Dr. R. W. Cummings, associate director of the Experiment Station, discusses the importance of the corn research program in a brief foreword. A bibliography containing 20 references and a series of 13 tables are also included in the publication, copies of which may be obtained by writing to the Agricultural Editor, State College Station, Raleigh.

Lack of Nitrogen Cuts Wheat Yield

Nitrogen starvation was one of the factors in the wheat yield this year, says L. E. Willoughby, extension agronomist at Kansas State College in Manhattan, and he cites yields of wheat after sweet clover and on non-sweet clover land as proof.

Clarence Almquist of Saline County is using sweet clover as his source of nitrogen for wheat. His yield this year on land that was in clover last year was 41.8 bushels an acre. Some wheat that was second year after sweet clover made 38.8 bushels, while his wheat on non-sweet clover land made 10.8 bushels an acre.

Ingram and Hubbard of Mitchell County

started using sweet clover on an upland farm in 1947. Last year, their wheat after clover made 40 bushels an acre, their no-sweet-clover land 12 bushels an acre. This year, the second year, after the clover crop, their wheat made 27 bushels per acre, and the wheat on land that had not been in sweet clover 18.8 bushels an acre.

"In two years," says Willoughby, "sweet clover land produced 67 bushels of wheat an acre, while similar or slightly better land made 31 bushels without sweet clover."—*Kansas State College Extension News Service, Manhattan, Kansas.*

Advise Nitrogen for Asparagus, Rhubarb

An application of nitrogen fertilizer to asparagus and rhubarb is advisable, says Jack Rose, Michigan State College horticulturist.

Harvest of asparagus should stop as soon as spears begin to come up small and spindling. Rhubarb harvest should stop when growth appears to be weakening. The harvest season on both crops usually ends in late June.

The nitrogen fertilizer application following harvest will stimulate foliage growth. Next season's crop depends on food manufactured by the foliage growing this season.

Nitrogen can be applied to asparagus by using 300 pounds per acre of granular cyanamide or 400 to 500 pounds per acre of ammonium nitrate. The cyanamide is also effective in controlling weed growth. For home garden use, applications of 400 pounds per acre are the equivalent of about five pounds per 100 feet of row.

Cyanamide should not be used on rhubarb. Ammonium nitrate at the rate of 400 to 500 pounds per acre is recommended for this crop.—*Extension Information Service, Michigan State College, East Lansing, Michigan.*

Check Corn Fields for Nitrogen Starvation

Now is the time to observe corn fields for evidence of "firing" or nitrogen starvation, advises C. E. Evans, agronomist at the Ohio Agricultural Experiment Station.

If "firing" exists, the yield of corn has undoubtedly been limited by inadequate nitrogen, and higher amounts of nitrogen should be included in next year's corn fertilization program.

Severe nitrogen starvation, continues Mr. Evans, shows itself early in the growing season as stunting, spindling, and yellowing of plants. Of more common occurrence in Ohio is nitrogen stress later in the growing season—after tasseling and during the all important kernel filling period. First evidence of trouble is a general light green appearance of the entire plant. This is followed by a yellowing of the older leaves which extend from the leaf tip down the midrib. Later the leaf tip begins to dry, and finally many of the lower leaves take on this appearance. Nitrogen starvation is more acute during a prolonged hot, dry period as has been the case in many areas of Ohio during this past August. When corn plants are suffering from lack of water, the leaves curl, wither, and dry without the leaves necessarily becoming yellow.—*Farm News, Ohio Agricultural Experiment Station, Wooster, Ohio.*

Yellow Corn Indicates Nitrogen Deficiency

One Franklin County (Arkansas) farmer discovered this year that a nitrogen deficiency in his soil, not too much rain, caused his corn to turn yellow during the growing period.

Hansel McCain, Pleasant View community, took the advice of County Agent Amos H. Underwood and applied nitrogen when his corn started turning yellow—even though he thought it was caused by too much rain.

He applied 70 pounds per acre of ammonium nitrate. Because of excessive rain before he completed this operation, he didn't apply the fertilizer to one acre. The corn on which he had applied nitrogen immediately took on a dark green color. That receiving no nitrogen became more yellow.

He estimates that he will receive 60 bushels per acre on the corn receiving nitrogen. Probably he will not harvest the other.

The Franklin county farmer grows cover crops of hairy vetch and Austrian winter peas. He turns these under in the spring, and applies 200 pounds per acre of complete fertilizer to his corn. He says that next year he is going to increase the amount of ammonium nitrate from 70 pounds to 100 pounds per acre.

Mr. McCain told County Agent Underwood that he had doubled corn yields by planting and turning under winter cover crops.—*Arkansas Agricultural Experiment Station.*

Prevent Nitrogen Starvation in Corn Is Agronomist's Advice

Nitrogen-hundry corn is what Virginia farmers have to look out for now if they expect to keep ahead of their North Carolina neighbors in the 1949 "corn war," says P. H. DeHart, agronomist at V.P.I.

The yellowing, or "firing," that so many farmers think is caused by dry weather, is really "plain nitrogen starvation," DeHart says.

(Continued on page 28)

Worrall Joins Davison Chemical Corporation Staff

The Davison Chemical Corporation of Baltimore, Maryland has announced the recent appointment of A. W. Worrall, well-known oil refinery engineer, to the post of Assistant Works Manager of their large Curtis Bay plant.

After his graduation from Rensselaer Polytechnic Institute in 1928, Mr. Worrall held a number of executive positions with the Texas Company and most recently with the Houdry Process Corporation which he joined in 1936.

During his connection with the later company, Mr. Worrall was in direct charge of design, construction, operation and maintenance of petroleum research facilities and pilot plants, and one of the oil industry's first synthetic catalyst cracking plants.

Davison believes that Mr. Worrall's broad background in chemical engineering and business promises even more outstanding service to their customers.

Program for Annual Meeting of Fertilizer Application Committee

The twenty-fifth annual meeting of the National Joint Committee on Fertilizer Application will be held on October 24th in conjunction with the meeting of the American Society of Agronomy at Milwaukee, Wisconsin. There will be morning and afternoon sessions, with General Chairman Charles H. Mahoney presiding. The list of papers to be presented and discussed is as follows:

Morning Session, 9:45 A. M.

Twenty-Five Years' Progress with the National Joint Committee on Fertilizer Application, *Ove F. Jensen, E. I. duPont de Nemours & Co.*

A Review of the Available Kodachrome Slides and a General Discussion of Fertilizer Distributing Machinery, *Glenn A. Cumings, U. S. Department of Agriculture.*

What's in the Bag, *Robert H. Engle, the National Fertilizer Association.*

Pasture Fertilization as it Affects Pasture Grazing in the Southeastern United States, *O. E. Sell, Georgia Agricultural Experiment Station.*

Deep Application of Fertilizers, *Arnold W. Klemme, Missouri Agricultural Experiment Station.*

The Influence of Breeding and Fertilization on Wheat Improvement in the Pocket Area of Southern Indiana and Illinois, *H. R. Lathrope, Indiana Agricultural Experiment Station.*

Afternoon Session, 1:40 P. M.

Newer Developments in Corn Fertilization in Southeastern United States, *B. A. Krantz and R. W. Pearson, United States Department of Agriculture.*

A Producer's Method of Fertilization for High Yield and Quality Corn Production, *P. E. Grubb, DeKalb Agricultural Association, Inc.*

Fertilizer Applications Through Irrigation Waters, *F. H. Leavitt, Shell Chemical Corp.*

A Summary of the Most Recent Work on Nitrogen Fertilization, *W. E. Colwell and Samuel Tisdale, North Carolina Agricultural Experiment Station.*

Potential Needs of Trace Elements in Fertilizer Practice, *E. R. Purvis and Firman E. Bear, New Jersey Agricultural Experiment Station.*

A Progressive Report on Plant Nutrition as Measured by Radioactive Trace Elements, *S. R. Olsen, Colorado Agricultural Experiment Station and N. S. Hall, North Carolina Agricultural Experiment Station.*

Let Your Imagination Work in Exploring Plant Nutrition Problems, *R. H. Bray, Illinois Agricultural Experiment Station.*

Conservation of Fertilizer and Moisture Through Cultivation of Turfs, *Fred V. Grau, United States Golf Association, Green Section.*

Southern Agricultural Workers To Meet in February, 1950

The annual meeting of the Association of Southern Agricultural Workers will be held at Biloxi, Miss., on February 9, 10 and 11, 1950. The tentative program for the meetings of the Agronomy Section include sessions of the Soils and Crops Divisions on February 9th; joint sessions of the Soils Division and Plant Physiology Section, Crops Division and Phytopathology Section, Soils Division and Phytopathology Section, Crops Division and Animal Husbandry Section on February 10th; joint session of Soils Division with Soil Conservation and Agricultural Engineering Sections, Crop breeding session of the Crops Division on February 11th.

The officers of the Agronomy Section are inviting papers to be presented at these sessions. Titles should be submitted by October 21, 1949 to Dr. W. H. Garman, Secretary of the Agronomy Section, Office of Experiment Stations, Washington 25, D. C., and to each of the following officers: O. E. Sell, chairman, Agronomy Section, Experiment, Ga.; W. B. Andrews, chairman, Soils Division, State College, Miss.; T. H. Rogers, chairman, Crops Division, Auburn, Ala.

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Principal Articles in This Issue

N. J. Agricultural College Holds Successful Fertilizer Conference

With an attendance of more than 100 fertilizer manufacturers and agricultural workers, the annual New Jersey Fertilizer Conference was held on September 29th at the College of Agriculture, New Brunswick, N. J. At the opening session in the morning, Dean W. H. Martin welcomed the visitors and touched on some of the problems facing New Jersey agriculture, which included the effects of certain insecticides on the flavor of some vegetable crops and the need for further experimental work on this subject. He also emphasized the need for additional laboratory facilities at the College, which would enable the department to render even better service to both the industry and the farmers of the state.

Stacy B. Randle, state chemist, reviewed briefly the changes which have been made in the New Jersey fertilizer law. Registration date has been changed to July 1st. Tonnage reports, by grades, are now to be made as of July 1st and January 1st. Plant foods other than nitrogen, available phosphoric acid and potash may be included in the guarantee.

Harold Evans, of the College, reported on experiments being made on the use of molybdenum in plant nutrition. In crops such as alfalfa, the presence of even minute quantities has proved to be the determining factor producing healthy plants. E. R. Purvis spoke on new developments in soil testing by the New Jersey Experiment Station.

Following luncheon, Russell Coleman, president of the National Fertilizer Association, discussed the proposed permanent agricultural program and pointed out the importance of a scientifically formulated fertilizer usage for obtaining the maximum efficiency in crop production. Graham Campbell, of Chamberlin & Barclay, Cranbury, N. J., spoke for the fertilizer industry on the topic "Fitting the Fertilizer to the Farm."

The chemistry of the growing plant was considered by Firman E. Bear in a talk entitled "Bread from Stones." Dr. Bear pointed out that as natural forces have turned rocks into fertile soil for the production of food crops, so science will meet the problems of adapting and multiplying those crops to meet the future needs of the world's increasing population. He gave an optimistic prediction of the discoveries that lie ahead of us in such fields as the chemical production of chlorophyl, proteins and other nutrient materials.

Sauchelli Elected Head of A. C. S. Fertilizer Division

At the recent meeting of the American Chemical Society held at Atlantic City, N. J., the Division of Fertilizer Chemistry elected the following officers for the coming year:

Chairman, Vincent Sauchelli, the Davison Chemical Corporation; *Secretary*, S.. F Thornton, F. S. Royster Guano Co.; *Members of the Executive Committee*, Firman E. Bear, New Jersey Agricultural Experiment Station, H. B. Siems, Swift & Co. Plant Food Division, C. A. Butt, International Minerals & Chemical Corp., Jackson B. Hester, Campbell Soup Co.; *Councilors*, James A. Naftel, Pacific Coast Borax Co.; A. L. Mehring, U. S. Department of Agriculture; *Alternate Councilors*, E. R. Purvis, New Jersey Agricultural Experiment Station, H. P. Cooper, South Carolina Agricultural Experiment Station.

Congress Passes New Army Ammonia Program

Provisions of existing law requiring the army to make available 10 per cent of its anhydrous ammonia production to domestic fertilizer manufacturers and to supply 50 per cent of the commercial fertilizer export commitments under the old IEFC world fertilizer distribution program were repealed by Congress on September 29th.

The action was taken with approval of the so-called Thomas amendment to the appropriations bill for the Economic Co-operation Adminstration for fiscal year 1950, which was sent to the White House for the President's signature. In addition to repealing the two sections of law relating to distribution of ammonia and fertilizer, the amendment also gave Congressional approval to army plans for operation of its three anhydrous ammonia plants, the Morgantown, Ohio River and San Jacinto plants, for the production of fertilizer for the occupied areas and for sale to south Korea.

Karrh Appointed Sales Head of V-C Fiber Division

John H. Karrh has been appointed sales manager of the fiber division of the Virginia-Carolina Chemical Corporation. Before joining the V-C organization, he was president and general manager of Applications Research, Inc. He will coordinate the sales activities of the new fiber division with the other operations of the company.

Hockley Elected Director of Glenn Martin Co.

Chester F. Hockley, president of the Davison Chemical Company, Baltimore, was elected a director of the Glenn L. Martin Company, one of the leading aircraft manufacturing companies of the country, at a meeting of the board of directors held September 17th. Mr. Hockley has served as president of the Davison organization since 1936.

Nitrogen Export Quota Increased

Establishment of a supplemental quota permitting exports of nitrogenous fertilizer containing up to 30,000 tons of nitrogen was announced September 23rd by the Office of International Trade. The supplemental quota raises the total amount of nitrogen that may be exported in the form of fertilizers during the fiscal year ending June 30, 1950, to 82,000 tons, the original quota for the year having been 52,000 tons.

License applications may be filed with OIT at any time and will remain valid until December 31, 1949. This time limitation is intended to permit foreign shipments to be made before the season when domestic demand for nitrogenous fertilizers is usually greatest. The supplemental quota was established in order to relieve producers who already have the material in warehouses and who have been forced to curtail production at this time.

Monsanto Announces Fellowship Awards

Monsanto Chemical Company has recently announced the award of five fellowships to graduate students in American universities to assist in their studies in chemistry and chemical engineering. The Company grants ten fellowships each year to outstanding students in these fields.

The awards announced during September are as follows:

Walter A. Donohue, Jr., of Swarthmore, Pa., for studies at Princeton University.

Ray Ellis, Jr., of Brookline, Mass., for studies at the University of Massachusetts.

Alex Kotch, of Edwardsville, Pa., for studies at the University of Illinois.

Andrew J. Kridl of Cambridge, Mass., for studies at Harvard University.

Robert M. Lindquist of Madison, Wisc., for studies at the University of Minnesota.

The fellowship awards run from $1,000 to $1,500 for each student.

August Tax Tag Sales

The aggregate of fertilizer tax tag sales in 10 States and of manufacturers' reports of fertilizer shipments in three States, was considerably lower during the month of August than in the same month last year, according to reports received by The National Fertilizer Association. During the past month a total of 262,514 short tons of fertilizer, or 13 per cent less than in the same month of 1948, was represented by the sales of tax tags and manufacturers' reports in the 13 Southern and Midwestern States for which figures are available.

The tonnage reported for August resulted in a calendar-year-to-date total of 6.4 million tons, almost 1.3 million tons more than for the corresponding period of 1948. The large increase in current year figures over those of previous years reflects the high tonnages reported for February, March, April and May when sales of tags plus shipment reports greatly exceeded comparable figures for any previous year. During the first two months of the current fiscal year, which began on July 1, equivalent tonnage figures adding up to 563,000 represent a considerable decline

(Continued on page 28)

FERTILIZER TAX TAG SALES[1] AND SHIPMENT TONNAGES[2]
(IN EQUIVALENT SHORT TONS)
COMPILED BY THE NATIONAL FERTILIZER ASSOCIATION

STATE	August		*Calendar Year Cumulative* January-August		*Fiscal Year Cumulative* July-August	
	1949	1948	1949	1948	1949	1948
Virginia	36,379	36,860	540,697	496,630	46,710	54,271
South Carolina	13,744	21,634	785,089	678,070	22,517	30,402
Georgia	8,929	11,237	1,031,873	941,653	15,451	21,737
Florida	42,134	42,200	593,405	470,773	77,942	70,924
Alabama	8,270	11,703	912,174	815,258	35,322	40,044
Tennessee	5,663	10,901	377,680	328,623	16,948	22,684
Arkansas	4,529	7,746	283,961	188,876	16,784	24,365
Louisiana[2]	7,044	1,471	197,731	135,778	12,586	6,821
Texas[2]	20,210	20,270	322,220	300,486	32,372	42,723
Oklahoma[2]	9,901	3,600	87,268	94,836	16,258	19,350
Total South	156,803	167,622	5,132,098	4,450,983	292,890	333,321
Indiana	50,820	69,493	542,379	595,711	177,059	187,010
Kentucky	22,031	33,166	374,522	410,453	40,107	67,721
Missouri	32,860	30,608	339,465	291,404	53,058	55,753
Total Midwest	105,711	133,267	1,256,366	1,297,568	270,224	310,484
Grand Total	262,514	300,889	6,388,464	5,748,551	563,114	643,805

[1] State fertilizer control officials in 10 reporting States compile monthly statistics on the sale of fertilizer tax tags and report these statistics to The National Fertilizer Association. The figures indicate the equivalent number of short tons of fertilizer represented by the tax tags sold to fertilizer producers and which are required by law to be attached to each bag of fertilizer sold in the various States. The equivalent tonnage represented by the sale of tax tags may be somewhat larger or smaller than actual sales of fertilizer, due to the lag between the purchase of tags and the delivery of fertilizer on which those tags are used.

[2] Current tonnage figures for Louisiana, Texas and Oklahoma are the shipments of fertilizer for use in these States as reported by manufacturers to the appropriate State agencies. Louisiana figures for 1948, Texas figures for months prior to June 1949 and Oklahoma figures to July 1949 were based on tag sales.

FERTILIZER MATERIALS MARKET

NEW YORK

Coal Strike Threatens Production of Sulphate of Ammonia at Steel Mills. No Shortage in Nitrate of Soda. Organic Markets Steady with Greater Interest from Fertilizer Trade. Superphosphate Shipments Picking Up. Potash Demand Still Good

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, September 28, 1949.

Sulphate of Ammonia

Should the coal strike be prolonged, it is felt this would have a definite effect on the production of sulphate of ammonia produced by the steel mills. No price changes were noted and some export business has been booked for shipment to the Far East.

Nitrate of Soda

This market is more or less a routine affair but buyers taking delivery as wanted and no shortage reported in any section.

Ammonia Nitrate

One Western manufacturer reduced the price of this material $1.00 per ton but demand is good and most shipments are being made against contracts. Some inquiry was noted for export.

Nitrogenous Material

Some producers are sold out entirely for nearby shipment and the demand is good from most sections. Prices vary from $3.60 to $4.00 per unit of ammonia ($4.37 to $4.86 per unit N).

Organics

Organic fertilizer markets were steady and as fertilizer manufacturers approached their heavy mixing season there was more interest. Tankage and blood were selling about $9.50 per unit of ammonia ($11.55 per unit N), f.o.b. shipping points. Soybean meal declined as new crop material started to come on the market and some sales were made at $72.00 per ton in bulk, f.o.b. Decatur, Ill. The demand for linseed meal was good in the Middle West from the feed trade and prices advanced about $2.00 per ton, to $64.00 per ton, f.o.b. Midwest production points. Cottonseed meal was mostly lower but there was some interest from the feed trade.

Castor Pomace

Producers are still sold ahead on this material and are not offering, with last sales made on the basis of $24.00 per ton. The demand is still greater than the supply.

Hoof Meal

Sales continue to be made at $7.50 per unit of ammonia ($9.12 per unit N), f.o.b. Western production points, and offerings are not plentiful.

Bone Meal

Fertilizer grades of bone meal were still scarce for nearby shipments but considerable quantities of imported feeding bone meal are being placed on the market. This material, however, has been readily absorbed by the feed trade.

Fish Meal

In some sections the fishing season was coming to a close but the boats were still out at most plants. The price of fish meal remains between $180.00 and $185.00 per ton, f.o.b. fish factories, but most of the material has already been sold. Some imported material is being offered from time to time but this is being bought mainly by the feed trade.

Superphosphate

Shipments are being made against existing contracts by producers and a good fall demand is looked for in most sections. Triple superphosphate was available in better quantities as new production facilities starting making shipments.

Potash

In some sections, the potash demand is very good and buyers are eager to get shipments on contract. Producers report shipments going along on schedule but the demand is still heavy. No imported material was being offered.

PHILADELPHIA

Late Mixing Season with Shipping Bottlenecks Feared. Materials Market Generally Dull. More Interest in Potash Re-sales Shown

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, September 26, 1949.

The general demand for raw materials continues rather dull with no particular interest in new purchases, except possibly bone meal and muriate of potash. The mixed goods situation is reported rather disturbing as it is feared continued delay in ordering will result in a later accumulation of stocks beyond the physical capacity to deliver during the shipping season.

Sulphate of Ammonia.—Market is steady with little purchasing interest at premium prices. While there is some concern as to the supply position in case of a steel strike, production of both coke-oven and synthetic grades has been considerably ahead of last year, which should help matters some if the strike does not last too long.

Ammonium Nitrate.—Production is said to be progressing favorably and the demand for later delivery is quite active.

Nitrate of Soda.—Market remains free from any unusual developments. Supply is ample to meet all requirements and no price changes are noted.

Cyanamid.—Demand is a little more active than usual and shipments are somewhat behind schedule.

Blood, Tankage, Bone.—Blood and tankage are easier and $9.00 per unit of ammonia ($10.94 per unit N), has been quoted on both articles. Bone meal continues in very active demand for prompt shipment with no supply obtainable from producers. Very infrequent offerings of resale range from $75.00 to $85.00 per ton, depending on the grade.

Castor Pomace.—Limited production is being spread over standing contracts and no new offerings are procurable.

Fish Scrap.—While bad weather has interfered with fishing, the production is still ahead of last year. Quotations remain at $175.00 for scrap, with 60 per cent menhaden meal at $180.00 per ton, and 65 per cent at $185.00. Some imported 60 per cent has been quoted at $175.00 per ton.

Phosphate Rock.—Demand remains steady with supply fully equal to requirements. Shipments to acidulators have picked up, but normally should be better at this time. A slight increase in the price in Florida is reported.

Superphosphate.—Demand could be better. There is sufficient material available to supply any normal demand. No price changes are reported.

Potash.—Production and deliveries continue in greater volume than last year but interest in resale is beginning to increase.

CHARLESTON

Organic Materials Show Upward Price Trend. Nitrate of Soda in Ample Supply. No Changes in Superphosphate and Potash Prices

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, September 26, 1949.

Demand for prime fertilizer ingredients is seasonal with organic sources of nitrogen showing an upward trend in price.

Organics.—The market on organics has strengthened and now quotations for domestic nitrogenous tankage range from $3.50 to $4.00 per unit of ammonia ($4.25 to 4.86 per unit N), in bulk, depending on the shipping point. Imported nitrogenous tankage is currently around $4.35 per unit of ammonia ($5.29 per unit N), in bags, c.i.f. Atlantic Ports for fall shipment. This price has taken into consideration the devaluation of the pound.

Castor Pomace.—Castor pomace supplies continue tight with movement primarily against existing contracts. Last sales reported were at $24.00 per ton in bags, f.o.b. northeastern production points. Imported castor pomace is indicated at varying prices from $32.00 to $38.00, c.i.f. Atlantic Ports.

Dried Ground Blood.—The Chicago market has recently strengthened and is now at around $10.00 per unit of ammonia ($12.15 per unit N), in bulk with the New York market approximately the same.

Potash.—Demand continues active with the current supply situation tight. No change in prices has been announced.

Ground Cotton Bur Ash.—This excellent source of carbonate of potash continues at around 75 cents per unit of K_2O, in bulk carload lots, f.o.b. Texas shipping point.

Phosphate Rock.—The market on this material continues firm, with stocks meeting the demand. No change in basic prices has been noted.

Superphosphate.—Demand continues seasonal and there is no shortage of stocks for current requirements. Prices continue firm at previous levels.

Sulphate of Ammonia.—Coke oven production continues at $45.00 to $48.00 per ton in bulk, f.o.b. the steel mills. Synthetic produc-

tion varies from $48.00 to $45.00, depending upon the point of production.

Ammonium Nitrate.—Domestic production of ammonia nitrate is offered at $58.00 per ton in bags, f.o.b. production point, with Canadian production priced at $63.00 per ton in bags, f.o.b. Port Robinson, Ontario.

Hoof and Horn Meal.—This excellent organic source of nitrogen is offered for shipment at around $7.00 per unit of ammonia ($8.51 per unit N), in bags c.i.f. Atlantic Ports. Domestic production of hoof meal is quoted at around $7.50 per unit of ammonia ($9.12 per unit N), Chicago basis.

Nitrate of Soda.—Demand is spotty and stocks are ample to take care of current requirements.

CHICAGO

Organics Market Recovers Somewhat from Recent Slump. Better Demand for Finished Feeds Reported

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, September 26, 1949.

It appears that the recent decline in animal ammoniates has been checked and a moderate recovery in prices has already been established. Recognizing that this recovery may improve further, the demand for finished goods has increased substantially but available supplies are in firm hands and as a rule higher prices are asked.

Meat scraps of 50 per cent protein are generally listed at $113.00 to $115.00 per ton. Digester tankage is listed at $125.00 to $130.00 per ton. These prices represent an advance of $5.00 to $10.00 per ton from the low point.

Dry rendered tankage is moving at $2.00 to $2.10 per unit of protein which represents an advance of 25 cents to 35 cents per unit. Wet rendered tankage is firm at $10.00 per unit of ammonia ($12.15 per unit N), and dried blood is selling at the same level. These figures represent an advance of about $1.50 per unit from the low point.

Steamed bone meal, 65 per cent, is quoted at $70.00 to $75.00 per ton and raw bone meal, 4½–45 per cent, at $65.00 per ton.

Margeson Addresses Controller Convention

James P. Margeson, Jr., Executive Vice President of International Minerals & Chemical Corporation was one of the principal speakers on the program of the annual convention of Controllers Institute in San Francisco on September 27th. Mr. Margeson's subject was "The Controller Key to Profits."

Bagpak Division Appoints New Sales Representative

International Paper Company's Bagpak Division has appointed Hugh O'Neill as sales representative in northwestern Ohio, northern Indiana, and Michigan except the peninsula. Mr. O'Neill's office is at 2408 Terminal Tower, Cleveland 13, Ohio.

W. W. Hendrickson, who has previously covered this territory, will continue as sales representative in the sections of Ohio and Indiana not covered by Mr. O'Neill, as well as in Kentucky and Buffalo and Niagara Falls, N. Y. Mr. Hendrickson's office address is the same as that of Mr. O'Neill.

H. D. Wellington will continue to cover the peninsula of Michigan as a part of his territory. His office is in Chicago at 400 West Madison Street.

July Superphosphate

Reports received by the National Fertilizer Association and by the Bureau of the Census from 183 superphosphate acidulating plants, which account for practically all of U. S. production, reveal that the July output, in terms of 18 per cent superphosphate, totaled 831,000 short tons. This figure represents a gain of roughly 21,000 tons over the June total and of 88,000 tons over the July 1948 output. Production during the first 7 months of 1949, however, is running approximately 100,000 tons behind the 6.4 million tons turned out during the same period a year earlier.

The output of normal superphosphate was almost exactly the same as in June, but a new monthly production record of 48,542 tons was set for the concentrated grade.

During the first seven months of 1949, more than 6,600,000 tons (basis 18 per cent A.P.A.) of all grades of superphosphates have been shipped to mixers or used in the producing plants. This is about 8 per cent above the figures for the same period of 1948.

Stocks on hand at producers plants on July 31st rose to 1,163,379 tons (18% basis).

Production	Normal 18% A.P.A. Tons	Concentrated 45% A.P.A. Tons	Base Goods 18% A.P.A. Tons
July, 1949.....	706,489	48,542	3,139
June, 1949.....	708,784	39,875	2,303
July, 1948.....	644,954	38,168	2,370
Shipments and Used in Reporting Plants			
July, 1949.....	552,729	31,738	378
June, 1949.....	595,158	39,544	1,799
July, 1948.....	605,191	22,048	592
Stocks on Hand			
July 31, 1949....	927,539	91,722	6,535
June 30, 1949....	769,727	74,918	3,730
July 31, 1948...	1,241,027	65,746	5,113

Bachman To Head New Davison Chemical Department

The Davison Chemical Corporation, Baltimore, Maryland has announced the appointment of Dr. Paul W. Bachman as manager of the newly formed department of Development Planning.

Dr. Bachman, who received his degree in Chemical Engineering and went on to earn his Doctorate at Johns Hopkins University in 1926, brings to the Davison Chemical Corporation a background of successful experience in research and development with such companies as E. I. duPont de Nemours & Company, General Chemical Co., the Victor Chemical Works and Commercial Solvents Corporation.

In his new capacity as manager of Development Planning with the Davison Chemical Corporation, Dr. Bachman will act as liaison between the Research, Operations and Marketing Divisions to smooth the way for the introduction of new, improved products, services and processes for industry.

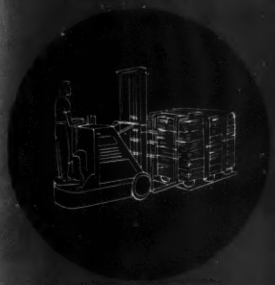
Northern Chemical Industries Building Ammonium Sulphate Plant

Northern Chemical Industries, Inc., of Searsport, Maine, a subsidiary of Summers Fertilizer Company of Baltimore, Md., has begun construction of a unit for the production of sulphate of ammonia. The Kuhlmann process, developed by Establissements Kuhlmann of Paris, France, one of the leading European chemical companies, is being used.

The new unit was designed by American Industrial Development Corporation of New York City. The construction work is being accomplished by Graver Construction Co., a division of the Graver Tank & Mfg. Co., of East Chicago, Indiana.

from design to delivery-

BETTER MULTIWALL BAGS



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Link-Belt Company Opens New Houston Plant

Link-Belt Company, well-known manufacturer of chains, elevators, conveyors, and power transmitting machinery, has announced that its new manufacturing plant in Houston, Texas, was formally opened on September 27th.

On this date, the Link-Belt Board of Directors held their quarterly meeting at the Shamrock Hotel, whereupon they proceeded to the plant to meet prominent men of Houston and vicinity and join them in an inspection of the new operations.

The new Houston plant, comprising approximately 45,000 sq. ft. of floor space, has been built to better serve the ever-expanding industries of the Great Southwest, either direct or through official distributors, of which the southwestern division of the company has a great many, scattered all over Texas, Oklahoma, Arkansas and Louisiana.

The new plant includes a one-story, all steel factory building with three bays, and a two-story office section of masonry construction in front. The plant proper consists of a modern machine shop, structural steel shop and large warehousing facilities.

Allen Craig, formerly located at the Link-Belt plant in Atlanta, is general manager of the company's Southwestern Division, with headquarters at the new Houston plant.

India Promoting Use of Bone Meal for Fertilizer

Representatives of bone mills in India met in New Delhi recently to consider measures for the development of the bone meal industry and to fix a reasonable price of the commodity. Bone meal is available in India in large quantities and can be used for increasing production of food grains. Nearly one million tons of bones are stated to be available in India annually, though only a very small proportion is utilized at present.

Jairamdas Daulatram, Agriculture Minister, speaking at the meeting, emphasized the need for placing the industry on a stable foundation as implementation of the food self-sufficiency plan necessitated greater attention to the development of manures. Bone meal, he said, was a useful manure and was available in large quantities in the country. Besides, crushed bones also earned foreign exchange.

Fertilizers for Bromegrass

Experimental work at the University of Nebraska Agricultural Experiment Station can answer questions on the application of fertilizer on sod-bound bromegrass, according to the institution's agronomist. The bromegrass plots are part of the experimental work at the Agricultural College.

Commercial fertilizers on the bromegrass were applied during the fall and spring at rates ranging from 60 to 240 pounds of nitrogen. Different commercial fertilizers on the market were used in the experiment. Agronomists say fertilizer has increased the growth of the brome several times and will increase the seed yield by several hundred pounds.

Arkansas Farmers Use Anhydrous Ammonia

Ten Lincoln County farmers have used anhydrous ammonia as a source of nitrogen fertilizer on approximately 5,000 acres this year, according to Robert W. Schroeder, county agent.

Special applicators are used to put the fertilizer six inches deep in the soil. This is necessary because anhydrous ammonia, a gas at ordinary temperatures, must be covered to prevent escape into the air. Tractor speed and valve settings regulate the amount applied per acre. For cotton, most farmers apply 10 gallons per acre. This provides approximately 40 pounds of nitrogen.

Anhydrous ammonia was first used in Lincoln County in 1947 by Dave Jones, Gould. Last year five farmers used it on approximately 3,000 acres of cotton and corn.

Classified Advertisement

WANTED: Fertilizer Plant. Purchase outright or purchase interest. Address "290" care THE AMERICAN FERTILIZER, Philadelphia 7, Pa.

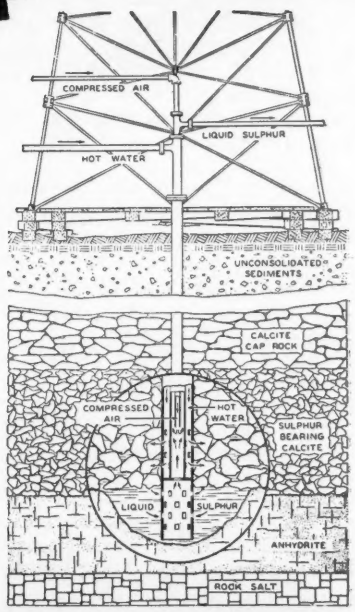
SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*WELL PIPING

The well equipment consists of pipes of various sizes, placed one within the other and extending from the surface into the sulphur deposit. A 10" or an 8" casing extends to and rests on the top of the cap rock. A 6" pipe, inside the casing, passes below it and reaches into the barren anhydrite. It is perforated at two different levels, separated by an annular collar. The upper set of perforations permits the hot water to enter the sulphur formation and the lower set permits the entrance of the molten sulphur to the discharge pipe fitted inside the 6" pipe.

When a well is "steamed" the hot water passes down the annular space inside the 6" pipe and outside the sulphur pipe and flows through the upper set of perforations into the porous formation. The entire mass through which the hot water circulates is raised to a temperature above the melting point of sulphur. The liquid sulphur being heavier than water, makes its way downward to form a pool and displaces water around the foot of the well, and rises in the well column through the lower perforations into a 3" pipe which is the sulphur discharge pipe. Compressed air released at the bottom of still another pipe fitted inside the 3" pipe rises and mixes with the sulphur column, forming an air lift which raises the liquid sulphur free of water to the surface.



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Nitrogen Application Formula for North Carolina Corn

As any experienced corn grower knows, an ample supply of nitrogen is a must for producing anything but average or low yields. But few farmers can agree just how much nitrogen is meant by "ample."

To find an answer to this question, Dr. B. A. Krantz, agronomist for the North Carolina Agricultural Experiment Station, conducted 49 fertilization experiments over the past five years. Dr. Krantz still hesitates to offer a blanket recommendation for all farms. But from the results of these tests he has been able to work out the "two-to-one" rule which any farmer can learn and adapt to his own conditions.

Here's how the rule works. For each two pounds of nitrogen applied, corn yields increase about one bushel per acre. In other words, each 100-pound bag of nitrate of soda which contains 16 pounds of nitrogen should increase the corn yield about eight bushels.

In some tests higher rates of side-dressing were used. For example, on the C. H. Parker farm near Princeton in 1947, yields were increased 101.8 (from 19.1 to 120.8) bushels per acre by the application of 180 pounds of nitrogen. This is the greatest yield increase ever recorded from nitrogen application in North Carolina.

To many farmers, the most striking thing about these experiments was that when adequate nitrogen was applied, the corn did not turn yellow and "fire up," even under droughty conditions. Although farmers are using more nitrogen side-dressing than ever before, fields of yellowed, nitrogen-deficient corn are still found too frequently in the state.

These corn tests and farmer experience have also shown that to make the best use of the side-dressed nitrogen other good production factors must be followed.

These other steps are:

1. Use an adapted hybrid or a proven local variety.
2. Adapt fertilizer at planting to your soil conditions.
3. Provide adequate stands.
4. Control weeds early but avoid late deep cultivation.

After a farmer has followed these first four steps he is ready to "cash in" on them by applying adequate nitrogen for his desired yield. Every farmer can figure his nitrogen side-dressing needs by using the following formula. First, figure your desired yield or possible yield in bushels per acre based on the other steps (particularly stand). Second, estimate how much your field will produce without any nitrogen. Third, subtract the second from the first to get desired yield increase. Then use the "two-to-one" rule—apply two pounds of nitrogen for each one-bushel increase desired.

Under average conditions it has been found profitable to apply 60 to 100 pounds of nitrogen side-dressing. (*Reprinted from "Patriot Farmer," Greensboro, N. C.*)

Power Production Co. Brings Out New Fertilizer Spreader

For orchards, vineyards, truck gardens and small acreage farms, Power Production Company of Chicago has introduced a new 5-foot Ezee Flow Model "55" fertilizer spreader and seeder. It has all the exclusive mechanical and performance features of the 8, 10 and 14 foot Ezee Flow models, but narrower width for short turning radius and easy maneuverability. Wheels are mounted behind hopper where they can't damage grapevines or snag low-hanging limbs. Hopper capacity 500 lbs.; spreads 20 rows evenly in full 5-foot strips or is easily adjustable for 2, 3 or 4 row application. Exclusive cam agitator insures uniform, accurate, no-clog spreading of hard, lumpy, wet

or other out-of-condition fertilizers. Ideal for sowing cover crops, applying powdered weed and insect poisons and spreading road chemicals to hold down dust or combat ice, as well as for "exact rate" application of all types of fertilizers.

Fertilizer Pays Off on Missouri Small Grains

Dent County (Missouri) farmers who participated in the fertilizer demonstrations on small grain this year found that the fertilizer applications returned large dividends and they and other farmers in the county are making plans to use more fertilizer this fall, according to C. M. Christy, county agent.

Forty bushels of wheat per acre is unbelievable for Dent County Lebanon soil, but Angus Flett had a yield of 40.57 bushels per acre where he applied 200 pounds of 0–45–0 plus 100 pounds of 0–0–60 at seeding time, plus 100 pounds of ammonium nitrate broadcast early in the spring. In addition, he pastured the wheat with a large herd of dairy cows from April 1 to April 15. A check strip that received the same treatment at seeding time but no ammonium nitrate made 17.16 bushels per acre. Thus the 100 pounds of nitrate was equal to 23 bushels of wheat. Another strip given the same treatment at seeding time and 100 pounds of urea instead of the ammonium nitrate yielded 29.15 bushels of wheat.

Harold Bays had oats on untreated land which made 11.7 bushels per acre while plowing under 260 pounds per acre of 0–60–0 fertilizer jumped the yield to 20.4 bushels. Another strip received an additional 100 pounds of 0–0–60 plowed under and 100 pounds of 3–12–12 and 100 pounds of ammonium nitrate with the seeding and it made 33.15 bushels of oats per acre.

These demonstrations showed that ammonium nitrate gave very little increase in yields when used without ample supplies of phosphate and potash and that ammonium nitrate used at the rate of 80 to 120 pounds per acre gave as good return in yield of small grain as higher applications.

Use of ammonium nitrate is recommended with other soil treatments for increasing fall pasture and grain although for grain alone a spring application will give somewhat higher yield than where applied only in the fall.

Where Henry Otto of Caldwell County used 400 pounds of fertilizer instead of 200 pounds he harvested 31 bushels of wheat instead of 21. He had planned to use only 200 pounds of 4–12–4 fertilizer an acre on the whole field last fall and did so on most of the field. But as he neared the finish he saw he would have some fertilizer left over, so doubled the application on the rest of the field.

Previously, Otto had limed the entire field. He is now convinced that heavier use of high-grade fertilizer, applied in good balance, is necessary for successful crop production. He is a patron of the county soil testing laboratory. He recently received the reports on samples he submitted from several fields on his farm and he plans to follow through on a program of "fertilizing the soil—as well as the crops." (*Missouri Farm News Service.*)

Heavy Cotton Weevil Threat for 1950 Crop

The weevil infestation in the cotton belt this year is being described by experts on insect investigations as the worst since 1927, when cotton farmers lost more than $400,000,000 to the pests. The extent to which cotton growers, before cold weather sets in, cooperate in carrying out suggestions of the Department of Agriculture will have an important bearing on demands that will be made next year on insecticide manufacturers for their products.

It is almost too late in the season now for the growers to get any economic benefits from heavy applications of insecticides so the department is advising them to harvest their cotton in time to cut and plow under the stalks before frost. Experience has shown that this is one of the best methods of reducing the number of weevils going into hibernation and, if followed, weevil control next year will be less expensive and less difficult.

Early cutting and plowing under of stalks removes fall feed for the weevils and prevents them from increasing in numbers. The pests

then go into hibernation hungry and partly starved, and winter weather kills them. But if the farmers let a high percentage of the weevils that go into winter quarters this fall live through the winter, the cotton farmers will have a hard fight next summer.

Link Belt Issues New Catalog on Ball and Roller Bearings

Link Belt Company has issued a new 112-page detailed catalog and engineering data book covering the company's complete line of ball and roller bearings. This book describes the principal construction features and gives list prices, weights, load ratings and all necessary dimensions for the various models.

The selection of the right bearing for the specific service has been greatly simplified, and a wealth of engineering information is given, including pages of selection examples and drawings of typical applications.

Other pages are devoted to welded steel base plates, lubrication fitting data, maintenance and lubrication. A copy of this book (No. 2550) may be obtained upon application to the main office, 307 N. Michigan Ave., Chicago, or to any branch office.

NITROGEN FOR PROTEINS AND PROTECTION AGAINST DISEASE

(Continued from page 8)

larger crops, but should we not give some consideration to its undoubted association with the protein content in the crop? Nitrogen and proteins are synonymous in the mind of the chemist, but nitrogen put into the soil has not been a guarantee of the fullest amount of protein or of the food quality of the subsequent crop. It has not been related to the complete array of amino acids to provide a balanced protein for animals and man. We may well give attention to the services and functions which proteins render in growing the body, whether that body be microbe, plant, animal, or man. We need to give more attention to proteins for their services in keeping bodies in good health by protecting them against the invading forces of disease.

Carbohydrates build plant bulk, but neither they nor the fats carry the power to grow. Only the proteins can propagate themselves, transmit life, multiply themselves and regenerate new cells by their own division. Life chemistry is carried on by means of the proteins. Some we call enzymes. They give speed to chemical reactions. Some we call hormones. They coordinate our body activities. Some we call viruses, producers of diseases. And some we call antigens that serve to protect us against disease. But all of them are of such chemical composition as to be classified as proteins. "Good healthy growth" in young people, we say can be had only by their consumption of plenty of proteins. Milk is the food commonly used to supply them. Recovery from sickness calls for protein-rich food. Tuberculosis is now arrested, and "cured" by a high-protein diet and rest. Protein in nutrition has come to be protection and guarantor of human good health, but we have not yet been ready to believe that nitrogen in the soil along with other fertility can similarly protect other forms of life like plants themselves. That fertile soils make plants rich in protein by which they protect themselves against fungus diseases and insects is a fact not yet accepted even though we are beginning to accept the idea that protein is protection for mankind.

Increasing the calcium content of a clay-sand medium growing soybeans demonstrated their increasing freedom from an attack by a fungus resembling "damping off." This increase in calcium in the medium was brought about by merely increasing the clay content in the sand. The clay was one of standardized proportions of exchangeable calcium and hydrogen leaving it acid at a *p*H of 4.4. Merely increasing the acid clay, and thereby the available calcium through root contact with more clay and calcium for larger amounts of this in the crop and for more nodulation and nitrogen fixation in the plants, was the sole difference between complete immunity from fungus attack and the complete destruction of soybean plants.

Protection Against Insects

In another demonstration, more protein in a spinach crop increased its ability to protect itself against the attack of leaf-eating thrips. Here the nitrogen offered per spinach plant

was varied through a series of 5, 10, 20 and 40 millequivalents (M.E.). Each of these levels of nitrogen was also combined with a series of 5, 10, 20 and 40 M.E. of calcium, the element commonly associated with the elaboration of nitrogen into the protein compounds synthesized by plants.

While all the plants were equally exposed to the thrips on the weeds growing nearby, the insects attacked only those spinach plants given the lower amounts, namely, 5 and 10 M.E. of nitrogen. Even on these, the attacks were less damaging as the amount of nitrogen was increased. With replications in which the content of calcium and nitrogen was increased ten times there was a clear-cut demonstration that as these two factors, nitrogen and calcium in the soil were increased to favor increased protein synthesis by the spinach plants, there was increased protection to the point of immunity against the insect attack. Here more protein within the plant provided more protection not against "disease" as it is commonly considered but against an invasion of and consumption by insects. Here was the suggestion that nitrogen, calcium, and other chemical fertility elements put into the plant meant not only protection but also higher food values. This constituted a far more effective escape from the insects than could have resulted from complex pesticides which offered no nutritional values to the plants.

Proteins Fight Disease

One may well raise the question whether an increased supply of available nitrogen and of other fertility, including the trace elements, in the soil is protection for crops because of the production of more of any one kind of amino acid and simple protein in the plants or because of the production of a more complete array of the different amino acids making up the proteins. When some trace elements seem to be more effective for animals and perhaps humans in consequence of their intestinal microbial synthesis into compounds; when trace elements in soil seem to come through the corn grain to encourage apparently healthier liver tissues in test rabbits; and when these same elements increase synthesis by alfalfa of the amino acids commonly deficient in corn, it appears to be evident that something more is necessary to provide a complete explanation than an arithmetical formula.

Nitrogen can be synonymous with protein and protein can mean much more in the way of protection against disease—even against insects—when once we understand more completely what a truly fertile soil is.

EXPERIMENT STATIONS ADVOCATE MORE NITROGEN

(Continued from page 10)

If your corn begins to fire, bring out the nitrogen, and apply it as a side dressing.

DeHart points out that 100 pounds of a 16 or 20 per cent nitrogen fertilizer will not cost more than $3.00. This amount of fertilizer should produce at least 10 bushels more corn.

County agents can advise on how to apply nitrogen as a sidedressing.—*Virginia Agricultural Experiment Station.*

AUGUST TAX TAG SALES

(Continued from page 14)

from the July-August 1948 total of 644,000 short tons. A recent issue of the *New York Journal of Commerce* attributes this decline to a return to pre-war last-minute buying habits on the part of farmers, especially in the Midwest.

Each of the 10 reporting Southern States, with the exception of Oklahoma, has shown larger figures thus far in 1949 than in January-August 1948. As a group, the Southern States have been responsible for the record monthly tonnages reported earlier in the year. With tag sales and shipment reports totaling over 5.1 million equivalent short tons, the South surpassed its 1948 record by almost 700,000 tons. The three Midwestern States, on the other hand, have reported a somewhat smaller tonnage for the first eight months of 1949 than they did for the same period a year earlier.

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

AMMONIA—Anhydrous and Liquor
Commercial Solvents Corp., New York City
Lion Oil Co. El Dorado, Ark.
Phillips Chemical Co., Bartlesville, Okla
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM NITRATE
Lion Oil Co., El Dorado, Ark.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

BAG MANUFACTURERS—BURLAP
Bemis Bros. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Paper
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Hammond Bag & Paper Co., Welisburg, W. Va.
International Paper Co., Bagpak Div., New York City
Jaite Company, The, Jaite, Ohio
Kraft Bag Corporation, New York City
Raymond Bag Co., Middletown, Ohio
St. Regis Paper Co., New York City
Virginia Carolina Chemical Corp,. Richmond,Va.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Huber & Company, New York City
McIver & Son, Alex. M., Charleston, S. C

BAG CLOSING MACHINES
International Paper Co., Bagpak Div., New York City
St. Regis Paper Co., New York City

BAG PRINTING MACHINES
Schmutz Mfg. Co., Louisville, Ky.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, The, East Point, Ga.
St. Regis Paper Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

BONE PRODUCTS—BONE BLACK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex M., Charleston, S. C.
Scar-Lipman & Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., New York Cjiy
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—For Hoists, Cranes, etc.
Hayward Company, The, New York City

BUCKETS—Elevator
Baughman Manufacturing Co., Jerseyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARS AND CARTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMICALS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Commercial Solvents Corp., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Lion Oil Company, El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Phillips Chemical Co., Bartlesville, Okla.
Scar-Lipman & Co., New York City
Spencer Chemical Co., Kansas City, Mo.
Virginia-Carolina Chemical Corp., Richmond,Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CONDITIONERS
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
Nat.onal Lime & Stone Co., Findlay, Ohio
Quaker Oats Company, Chicago, Ill.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

CYANAMID
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER (Mixed) MANUFACTURERS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Minerals & Chemical Corporation, Chicago
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Machine Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

HOPPERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore ,Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Scar-Lipman & Co., New York City
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., New York City

LEAD BURNERS
Southern Lead Burning Co., Atlanta, Ga.

LIMESTONE
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Findlay, Ohio

LOADERS—Car and Wagon
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Kent Mill Div., Abbé Engineering Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Baughman Manufacturing Co., Jerseyville, Ill.
Hayward Company, The, New York City
Hough Co., The Frank G., Libertyville, Ill.
Power Production Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Universal Vibrating Screen Co., Racine, Wis.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.

MINOR ELEMENTS
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., New York City

NITROGEN SOLUTIONS
Lion Oil Company, El Dorado, Ark.
Phillips Chemical Co,, Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

NITROGENOUS ORGANIC MATERIAL
American Agriculture Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Winkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monsanto Chemical Co., St. Louis, Mo.
Sackett & Sons Co., The A. J., Baltimore, Md.
Southern Lead Burning Co., Atlanta, Ga.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
Scar-Lipman & Co., New York City

POTASH SALTS—Manufacturers
American Potash and Chemical Corp., New York City
Potash Co. of America, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
United States Potash Co., New York City

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCALES—Including Automatic Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BUYERS' GUIDE

SCREENS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Universal Vibrating Screen Co., Racine, Wis.

SEPARATORS—Air
Kent Mill Div., Abbé Engineering Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
Lion Oil Co., El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Phillips Chemical Co., Bartlesville, Okla.
Scar-Lipman & Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.

SULPHURIC ACID
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U.S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U.S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
U.S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

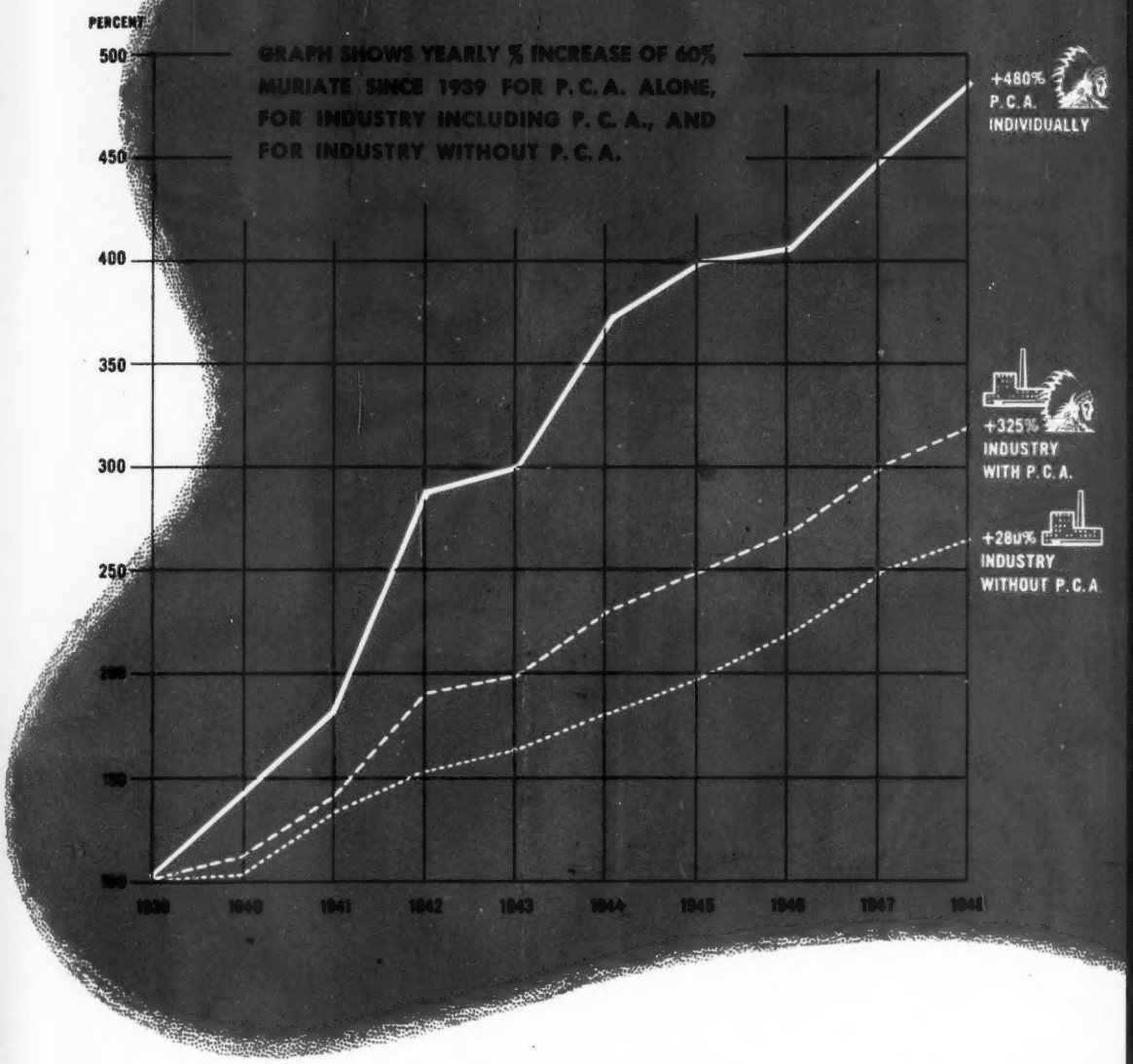
TAGS
Keener Mfg. Co., Lancaster, Pa.

TANKAGE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

Alphabetical List of Advertisers

We've been doing some figuring...



1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 280% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

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Sul-Po-Mag supplies both potash and magnesium in a properly-balanced, natural combination in the most practical and economical way. Both the potash and magnesium are in water-soluble form and are quickly available to crops.

Sul-Po-Mag is produced exclusively by International from langbeinite ores at its Carlsbad, New Mexico, mines. It is available to you now in larger quantities than ever before to help you satisfy the rapidly growing demand of farmers for plant foods required to meet magnesium-deficient conditions in their soil.

SUL-PO-MAG (Water-Soluble Double Sulfate of Potash-Magnesia)
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